THE EFFECT OF GROUP ORGANIZATION ON THE RELATIONSHIP BETWEEN LEADER INTELLIGENCE AND GROUP PERFORMANCE

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Patricia A. Scannell

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ABSTRACT

This study examines the effects of two types of group organization on the relationship between leader intelligence and group performance. The intelligence of the leader was varied in 36 three-person groups. Groups were matched on member intelligence levels and were sexually homogeneous to reduce error variance. The two types of organization employed were collaboration which involved the group working together on each subtask, and coordination which had subtasks arranged in order of precedence, with individual group members working on different subtasks.

There were no significant differences in group performance for different leader intelligence levels. Coordinated groups were superior to collaborative groups but no interaction effect was found between leader intelligence and group organization. It is suggested that this lack of expected interaction was due to matching groups on intelligence levels. These results are discussed in the light of Fiedler and Leister's (1977) multiple screen model.

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CHAPTER I

INTRODUCTION

Because every organization wants to utilize its leaders or managers most effectively a great deal of research has centered on leaders and leadership (Mitchell 1979). One such area of research has looked at the leaders' abilities and the conditions under which those abilities can be most effective.

Intelligence is one of the most important leader characteristics and this is reflected in the importance placed on this area in management selection and promotion (Randle 1956, Howell 1976). However, in some studies, the difference between groups with high intelligence leaders and those with low intelligence leaders has not been very significant. (It must be stated at this point that the terms low intelligence and high intelligence, as used here, do not refer to the extremes of the normal population. Rather they suggest relatively low and high leader intelligence among the population studied.) Consequently the question of which conditions enable high intelligence leaders to be most effective is worthy of study to ensure that the valuable

resource of intelligent leaders can be employed most fruitfully.

Previous research has observed high and low intelligence leaders and related their performance to such variables as the presence or absence of stress (Fiedler, Potter, Zais and Knowlton 1979), the relations between the leader and the group (Fiedler and Meuwese 1963), and leader motivation and leader experience (Fiedler and Leister 1977, Csoka 1974).

Most of the conditions previously studied have related to personal or interpersonal factors within the group. The importance of contextual or environmental variables must also be considered. One such contextual variable is that of group organization, that is, the way in which the group is organized to perform the task.

This factor has been studied in relation to its effects on leader creativity (Kabanoff and O'Brien 1979b). In one type of group organization (coordination) it was found that highly creative leaders were more effective than equally creative leaders were in the other type of organization (collaboration).

The main aim of this study, then, was to examine the

effects of group organization on the relationship between leader intelligence and group performance.

CHAPTER II

LITERATURE REVIEW

This literature review considers the relationship between leader intelligence and group performance. The multiple screen model devised by Fiedler and Leister (1977) to explain this relationship is described and studies testing this model are reviewed. Other studies which have investigated leader intelligence are also reviewed. The variable of group organization is considered in the light of its possible effect on the relationship between intelligence and performance. Finally, group tasks and their effects on small group research are considered.

Leadership does not stand alone as an area of research but rather, as a leader cannot be a leader without a group, the leadership literature has grown and developed through the larger area of small group research.

Recent annual reviews by McGrath and Kravitz (1982) and Zander (1979) cover hundreds of new studies. These reviews and important texts on the topic (Shaw 1971,

McGrath 1982) consider the wider context of what influences and behaviours operate on and within a group. The effects of social pressures within and without the group, the cohesiveness of the group, the effect of the group size and structure, the communication networks and the group goals have all been studied by many experimenters.

It is against this background of small group research that we turn to the area of leadership. Leadership is one of the most frequently investigated areas of research. For example, Stogdill's Handbook of Leadership (1974) contains around 3,000 references (Bass's 1981 revision of this text contains over 4,000 references). However this study cannot consider reviewing the mass of literature relating to leadership, but instead is focused on the area of research which considers leader's abilities in general and the intelligence of the leader in particular.

In spite of the fact that intelligence is considered to be one of the most important predictors for many management positions, the relationship between leader intelligence and the performance of the group is not yet completely understood. Previous reviews of the literature reveal inconsistent and weak correlations.

Mann (1959) reported the typical correlation between a leader's intelligence and the group performance to be between .10 and .25. Later reviews (Stogdill 1969, Campbell, Dunnette, Lawler and Weick 1970) report median correlations of .26 to .30. A number of writers, when considering leader intelligence and the resulting confusing relationship to group performance, have concluded that other factors must be modifying the relationship between intelligence and performance (Heslin 1964, Fielder and Leister 1977). Some of the studies investigating these factors will now be reviewed.

II 1 RESEARCH ON LEADER INTELLIGENCE

In order to provide more understanding of the situations in which leader intelligence is effective a number of different factors have been studied. Some of these have emerged from general group research and others from specific leadership situations.

One factor which has been found to affect the leader intelligence/group performance relationship is leader-group relations as measured by group atmosphere or group cohesiveness (Fiedler and Meuwese 1963). In this study the data were analyzed to determine the

relationship between leader intelligence and group performance and the groups were divided into cohesive and uncohesive groups. The correlations showed consistently that leader intelligence was related to group performance in cohesive but not in uncohesive groups.

Group cohesiveness has been found to have a similar effect on performance in a number of studies not looking at leader intelligence (Fiedler 1962, Konar-Goldband, Rice and Monkarsh 1979). However, a review by Stogdill (1972) found an equally large number of studies which showed no relationship between group cohesiveness and performance as those which did show a relationship.

From the perspective of this study, the focus must remain on those studies relating to the relationship between leader intelligence and group performance. However, here too, differences exist. Fiedler and Leister (1977) considered leader-group relations as part of their multiple screen model described below. Their results showed that good leader-group relations were the same as bad leader-group relations. That is, leader intelligence was not related to group performance in either good or bad leader-group relations conditions.

Fiedler and Leister (1977) suggest that this

unexpected finding could be due to a misapplication of leader intelligence in groups with good leader-group relations. Leaders in these groups are suggested to be concentrating more on interpersonal factors and less on production oriented factors. Fiedler and Meuwese (1963), however, suggest that leaders in uncohesive groups may be forced to apply their intelligence chiefly to maintaining the group thus reducing their input to group performance.

It is possible that both of these aspects are correct and that it is the extremes of leader-group relations which are negative in the ways described above. Consequently average leader-group relations could reflect a leader free to concentrate on group performance. This could provide an explanation for the varied results described above.

Chemers, Rice, Sundstrom and Butler (1975) considered leader intelligence and training in relation to group performance. Low intelligence leaders were found to have higher group productivity than high intelligence leaders. High intelligence leaders did benefit more than low intelligence leaders from training as their groups' production increased. However they were still less productive than the low intelligence leaders. A possible explanation for these results is given in the

results of postsession questionnaires which indicated significantly lower stress levels in the groups with low intelligence leaders. Thus the stress present in the high intelligence leaders' groups could have been hindering the leaders' intelligence from affecting the groups' performance. The significance of stress as a moderator variable is considered below in the multiple screen model.

Leader motivation as measured by the LPC "least preferred co-worker" score was also studied by Chemers et al (1975). This scale is one which asks the leader to describe one person in his experience with whom he had the most difficult time completing a job. The concept was first introduced in Fiedler's Contingency Model of Leadership Effectiveness (1967) which maintains that successful performance by the group is dependent on the interaction of the situation and specific leader characteristics. Much has been written in criticism of LPC both as a concept and as a measurement tool.

A critical review by Schrieshem and Kerr (1976) cites conflicting evidence from different studies to show the unreliable nature of the LPC scale. They point out that it lacks construct validity as a consistent understanding of its meaning has not been adopted. Thus,

they describe it as a 'measure in search of a meaning'. Several studies are reviewed which cite that LPC measures task relevant abilities. However, from an operational standpoint LPC is intended to reflect personal or interpersonal attributes. Schrieshem and Kerr (1976) consequently conclude that it lacks content validity. Predictive validity and test-retest reliability are also questioned by Schrieshem and Kerr as they review further studies concerned with LPC.

It is obviously beyond the scope of this review to investigate the debate further. However, it must be acknowledged that LPC would appear to be an unreliable screen variable. It has been observed to be an inconsistent moderator of the relationship between intelligence and performance as Chemers et al (1975) found different results to those of Csoka (1974).

II 2 MULTIPLE SCREEN MODEL

Fiedler and Leister (1977) developed the Multiple Screen Model in order to explain the low correlations described above. The model assumes a series of "screens" through which the leader's intellectual output must travel in order to affect the group's performance. The

"screen" is seen as any factor which can totally, or partially, block the leader's intelligence from influencing the task performance. Thus the screens are described as being of "variable permeability". In some group situations where a specific positive factor is present (or a negative factor is absent) this factor's screen is considered permeable and the leader's intelligence will affect group performance. Consequently the correlations between leader intelligence and group performance will be high. Screens, therefore, help or hinder the effects of the leader's intelligence in reaching group performance. This can be shown diagramatically by Fig 1.

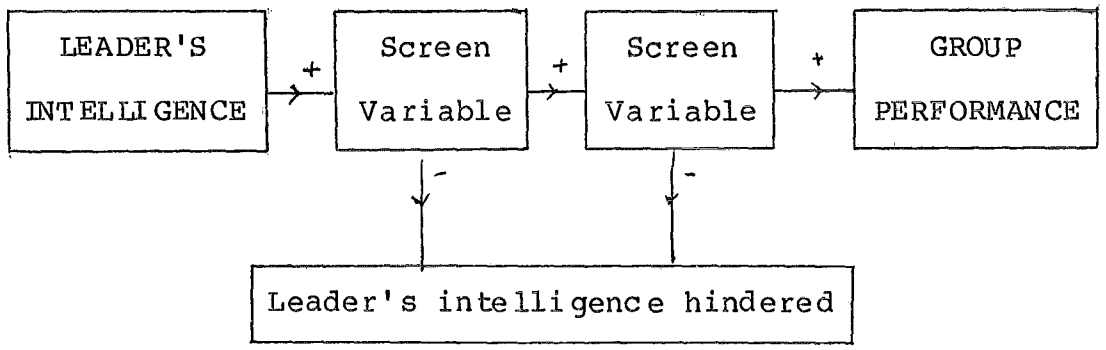


FIGURE 1 The Effect of Screen Variables on the Relationship between Leader Intelligence and Group Performance as Explained by the Multiple Screen Model.

Fiedler and Leister (1977) suggested various personal and interpersonal variables which, acting as

screens, either facilitate or inhibit the effects of leader intelligence. They were leader motivation, leader experience, leader-boss relations and leader-group relations. The leader motivation screen described how the leader felt about his/her job. Thus this screen was seen to be in a permeable state when the leader had a positive and favourable motivation to his/her job. The leader experience screen was seen as experience the leader had gained in his/her work and was measured by the amount of time he/she had been in the job. It was suggested that leaders who had been in the job longer would be more capable of using their intelligence to affect the group. Because of the nature of the leader's relationship with the boss, the presence of stress in this relationship was seen to be a screen variable. Thus a high stress relationship would form an impermeable screen through which the leader's intellectual output would have difficulty in passing. Leader-group relations was also investigated as a screen variable because of the difficulty leaders have in situations where they are not supported by a compliant group.

The model was tested by Fiedler and Leister (1977) using army infantry squad leaders. The performance criterion was based on the ratings of the group by two superiors. The hypothesis was supported in that most of

the correlations (between leader intelligence and group performance) in the permeable condition were significant, that is, where the leader's motivation was high, the leader's experience was high, the stress between leader and boss was low and relations between leader and group were good. Conversely, in the impermeable condition, where these screens were negative and acting as hindrances, most of the correlations were low and insignificant.

The only exception to these general trends was the leader-group relations screen where a permeable condition (good leader-group relations, as perceived by the group) failed to differ significantly from the impermeable condition. Fiedler and Leister suggested that this may have been due to misplaced leader intelligence as was described above. That is, where the leader worked more on maintaining good interpersonal relations rather than on task performance.

The most striking finding discussed by Fiedler and Leister is the effect which a stressful relationship with the boss has on the correlation between leader intelligence and group performance. When boss stress was low, intelligence was correlated significantly with performance ($r=.40$) but when stress with the boss was

high, intelligence did not correlate with performance (r=.07). Referring to research on anxiety and stress (e.g. Lazarus 1966,) Fiedler and Leister concluded that stress with the boss was the most important single factor in blocking the relationship between leader intelligence and group performance.

At least three other studies have used the basis of the multiple screen model to investigate relationships between leader intelligence (or other important leader abilities) and group performance. Two of these dealt specifically with the stress screen variable. Fiedler, Potter, Zais and Knowlton (1979) reviewed Fiedler and Leister's (1977) findings in the area of stress with the boss and also reviewed three other unpublished studies which replicated these results. A further study by Potter and Fiedler (1981), although not specifically related to the multiple screen model, found leader intelligence correlated negatively with performance evaluations when stress with the boss was high.

Frost (1983) described Fiedler and Leister's (1977) multiple screen model and the evidence of stress as moderating the relationship between intelligence and leadership performance. In order to better understand the role of the relationship between leader and boss and

the stress within the relationship, Frost related these ideas to role perceptions. He argued that stress with the boss was best described as behaviour which lead to role conflict and ambiguity for subordinates in leadership positions. Using these perceptions Frost found that leader intelligence has a positive relationship with performance only when such stresses were low. Thus data have been generated supporting the principle of stress as a screen variable between leader intelligence and group performance.

Another study that used the multiple screen model to consider the relationship between a specific leader ability and group performance proposed two situational variables as screens (Kabanoff and O'Brien 1979b). These variables were the group's task organization and the ability of subordinates. Although Kabanoff and O'Brien (1979b) were relating these screens to leader creativity, their results would appear to be relevant to leader intelligence. Using two main types of organization they found that groups using what they called a 'coordination structure' were more effective than those using a 'collaborative structure'. The details of these structures will be given below when group organization is considered in more detail. At this point it is sufficient to conclude that Kabanoff and O'Brien's

proposal of group organization as a screen variable was supported as the results showed leader ability was not related to group performance in collaborative groups but was related in coordinated groups. Therefore collaborative organization would appear to hinder the leader's ability and thus could be classed as the impermeable state while coordination could be seen as the permeable state of the screen allowing the leader's ability to flow through to affect group performance.

II 3 THE QUESTION OF MEDIUM LEVELS OF INTELLIGENCE

It is interesting to note when reviewing studies of leader intelligence and its relation to group performance that the leaders are usually only differentiated into low and high intelligence categories. Chemers et al (1975) in their study relating LPC and leader intelligence to group productivity made the tentative proposal that the more successful groups were those with either 'bright' or 'complex' leaders but not both. (These 'types' were defined through combinations of high and low intelligence and high and low LPC i.e. high LPC/low intelligence = complex and low LPC/high intelligence = bright.) Thus Chemers et al theorized that there may be an optimal level of cognitive

functioning.

Relating this solely to leader intelligence it introduces an interesting point. Could there exist an optimal level of leader intelligence and if so could it be at the middle level somewhere between the extremes of high and low? When the author first began this area of research into leader intelligence, a number of non-psychology business and managerial friends suggested that a leader of too high intelligence was often too far beyond the workers and thus communication and task instruction was difficult.

This has been shown to be true. In a study of three groups of managers the relationship between intelligence and managerial success was found to be curvilinear (Ghiselli 1963). It was found that both the low intelligence and the very high leaders were less likely to achieve success than those with intelligence scores at intermediate levels. It would appear relevant to investigate this area in relation to the factors interfering in the leader intelligence/group performance relationship. Are the principles of the multiple screen model also relevant to this group of leaders?

II 4 GROUP ORGANIZATION

Fiedler and Leister's multiple screen model considered only personal or interpersonal variables. However they acknowledged the possible presence of other factors which could act as a screen between intelligence and performance. Many studies have considered the effects of the environment in which leadership occurs on the behaviour or style of the leader (Ford 1981, Kerr and Jermier 1978, Howell and Dorfman 1981).

One environmental or contextual variable investigated by Kabanoff and O'Brien (1979b) was mentioned above. This variable, group organization, will now be discussed in the light of its possible effect on the relationship between leader intelligence and group performance.

O'Brien (1968) described two basic forms of cooperation which can occur in a work group. The first form, collaboration, describes group members working simultaneously with one another on the same subtasks. These subtasks are the joint responsibility of all positions in the group and require members to work together. An example of a group with a high degree of

collaboration would be a tandem-cycle pair. The second form of group cooperation was called coordination. This type of structure is one in which group members have different subtasks to perform and those subtasks are ordered by definite precedence relationships. This can be most aptly illustrated by likening a coordination group to an assembly line situation.

These group structures were analyzed by O'Brien (1968) using concepts of structural role theory which assumes that an analysis of the structure must precede an analysis of the interactions of a group. For a more detailed explanation of structural role theory and the schematic digraphs showing the organizational structure used by groups in this study see Appendices 1 and 2.

Kabanoff and O'Brien (1979b), in their study of the relationship between leader creativity and group performance as affected by group structure, suggested that the low and inconsistent correlations between leader intelligence and group performance could be due to group structure. Most studies of small group behaviour have traditionally used a collaborative task organization. However Kabanoff and O'Brien (1979b) and O'Brien and Owens (1969) found a coordinated group structure more effective. Kabanoff and O'Brien, as stated above, found

a relationship between leader ability and group performance in a coordinated structure but no relationship in a collaborative structure.

The question of leader intelligence and group structure has been previously investigated in an unpublished paper (O'Brien and Owens 1968). However, in contrast to the later results, intelligent leaders were found to have more effect in groups using a collaborative structure. At this point O'Brien and Owens (1968) suggested that a collaborative structure made it possible for the leader or some other intelligent person to make the major contribution, while in a coordinated structure the principle of a chain being as strong as its weakest link prevailed. Thus the more intelligent leaders were unable to overcome the effects of the least intelligent members. In their later work Kabanoff and O'Brien (1979b) suggest the success of the high intelligence leaders in the coordinated groups is due to these leaders being released from the need to maintain harmonious interactions among group members.

Coordinated groups have been found to be more effective in a number of studies (O'Brien and Owens 1969, Kabanoff and O'Brien 1979a, Kabanoff and O'Brien 1979b, O'Brien and Kabanoff 1981). The clear results of

Kabanoff and O'Brien (1979b) would appear to suggest that group structure or organization is a very strong possibility as a screen variable between leader intelligence and group performance. One explanation of the confusing results of the earlier study may be possible experimental flaws. O'Brien and Owens (1968) used a correlational analysis not manipulating the variables of interest but measuring them on a post hoc basis. It would be helpful therefore to follow the experimental design of Kabanoff and O'Brien (1979b) in relation to leader intelligence, with an experimental study which allows for intelligence to be explicitly varied rather than measured on a post hoc basis.

II 5 GROUP TASKS IN SMALL GROUP RESEARCH

A number of reviews have spoken of the need for theoretical integration in the area of small group research (Hare 1962, McGrath and Altman 1966). One of the areas specified as requiring such integration was that of group tasks. Consequently, when planning a small group experiment, the literature relating to this area should be considered. Hackman (1968) found that most investigations had used different tasks with many diverse output measures for gauging group performance. These

different tasks were found to produce up to 50% variance on the output measures attributable specifically to the tasks themselves. Hackman created a standard pool of tasks drawing from these different task types; production, discussion and problem solving.

These standard tasks were used by Kabanoff and O'Brien (1979b) in a study of the effect of task type and group structure on group productivity. They found significant group structure and task type interaction effects. However they describe these as 'minor' as they accounted for little of the variance in group performance. Hackman (1968) stressed the need for holding tasks constant across different conditions within a study to maintain internal validity and encouraged the use of standardized tasks to increase external validity in comparing conclusions from study to study.

It is interesting to note finally, the relatively small number of recent laboratory studies within the leadership field in comparison to field studies, and also the wide variety of tasks used in field settings (Bass 1981).

CHAPTER III

HYPOTHESES

This study used an experimental design to consider the effects of group organization on the relationship between leader intelligence and group performance. Two major hypotheses, developed from previous results in the literature, were tested.

Hypothesis 1 - Medium and/or high intelligence leaders with coordinated structure groups will be more productive than medium and/or high intelligence leaders of collaborative groups.

Hypothesis 2 - Coordinated structure groups will be more productive than collaborative structure groups.

Two additional hypotheses were also tested.

Hypothesis 3 - Medium intelligence leaders will have more productive groups than those of high intelligence leaders.

Hypothesis 4 - If postsession stress measures are low and leader-group relations, as measured by group atmosphere results, are medium those groups with medium and high intelligence leaders will be more productive than those groups with low intelligence leaders.

CHAPTER IV

METHOD

IV 1 DESIGN

This study employed a 2 x 3 factorial design with three levels of leader intelligence (low, medium and high) and two levels of group organization (collaboration and coordination). There were six three-person groups per cell. In order to eliminate as many sources of unwanted variance as possible, groups were sexually homogeneous and group members were matched on intelligence level. That is, one person from each group was drawn from the low intelligence level, one from the medium and one from the high intelligence level. There were 14 women's groups and 22 men's groups.

IV 2 SUBJECTS

Subjects were volunteers drawn from the student population at the University of Canterbury. They were recruited either through friends of the author, through

requests being made in lectures or through notices asking for volunteers. 118 students volunteered in this way. Of these, four were eliminated from the sample after a screening intelligence test. Two students were found to be experienced at crosswords at this point and were rejected, as were two overseas students who would have been culturally disadvantaged by the test.

The remaining 114 were sorted into groups according to their intelligence test results, sex and availability for testing. Only 108 students were used in the second stage of the testing. The other six were not eliminated by selection but were mainly unavailable when needed.

Of the 108 students tested in the experiment 66 were male and 42 female. The majority of them (86%) had been at University three years or less with the greatest number being second year students (44%). Only three of the volunteers were part time students and five were postgraduates.

The volunteers were representative of a wide variety of degrees; 37% were studying for B.Sc., 24% for B.A., 16% for B.E. and 10% for B.Com. The remaining students were studying for degrees in law, music, fine arts, education or were attempting intermediate years for

medicine or surveying.

Subjects were also asked to specify their major subjects and 34 different subjects were represented. The largest single group were those with psychology as their major. This is understandable as these subjects would tend to be more interested in and more sympathetic to volunteering requests. Overall, however, this was a reasonably varied sample of the University population.

IV 3 PROCEDURE

Volunteers were told they would be required to participate in an intelligence test and a small group experiment. They were screened to eliminate those who were experienced at crossword puzzles. This was defined as those who attempted a crossword puzzle of any type on average of once a week or more. Students for whom English was a second language were also screened out to eliminate variance caused by cultural differences created by the test (Prentice, 1972).

At the first session subjects completed the AH5 intelligence test which was administered according to the conditions described in the manual (Heim, 1968). The

subjects also filled out a biographical data form (see Appendix 3) which contained questions about status as a student and the courses they were studying. This form also requested subjects to specify when they would be available for further testing.

From the results of the AH5 test subjects were classified as being of low, medium or high intelligence. (Low was defined as a score of 33 or less, medium s as 34 to 41 and high 42 and upwards). They were then assigned to groups according to their intelligence test scores, their sex and their availability for testing. The experimenter then informed the subjects by telephone of the time and date selected from their options for the small group session.

The groups were randomly assigned to one of the six conditions using random number charts. Men's and women's groups were treated separately in order to ensure an even distribution in all conditions. Groups were assigned a number in the order they were tested thus the first men's group tested became 1 (male) and was tested in the condition to which this number had been assigned.

As each group contained a member from each third of the intelligence range the leader was specified by the

random assignment procedure. Thus if a group fell into the low leader intelligence cell the low intelligence member became the appointed leader.

As a group reported for the small group testing session they were told which member had been given the leadership position. However, they were unaware of their own or the leader's position on the intelligence scale. Those who wished to learn their own positions were informed after the test was completed.

The group was then read a short introduction explaining that the purpose of the experiment was to investigate small group behaviour. They were told that the leader would be given specific instructions related to the task and would inform the group. It was stressed that the experimenter was interested only in the group's task performance and that no other observations would be made on the group and their interactions. This was to assuage any suspicions of experimenter deception which many volunteers had raised. This was found to come mainly from psychology students who were aware of experimental designs where such deception had been used.

After this explanation by the experimenter, the group members were asked to wait outside while the leader

received further instructions. This followed the procedure outlined by Kabanoff and O'Brien (1979b) where the leaders were given instructions concerning the organization of the group and the task, a series of crossword puzzles, which they were to work on.

There were two separate sets of instructions; one was read to those leaders of collaborative groups (see Appendix 4) and another to those of coordinating groups (see Appendix 5). Leaders were also given a written instruction sheet which repeated in diagram form some of the information contained in the instructions. This was to help leaders remember details during the session and to avoid the need for the experimenter to be involved repeating such details during the session. Thus all information and structure details were relayed to the group members by the leader. Again there were two instruction sheets; a collaborative (see Appendix 6) and a coordinating (see Appendix 7) explanation.

Leaders explained the group structure and task to the group and then answered questions from the group. They then worked for 3 minutes on Puzzle A; a practice puzzle which was not marked (see Appendix 8). As the purpose of this puzzle was to familiarize subjects with the style of the puzzle, the group then spent a short

time discussing the puzzle. They then worked on Puzzles 1,2 and 3 (see Appendix 9, 10 and 11) for five minutes each.

After the puzzles were completed each member was asked to complete a questionnaire describing the atmosphere of the group (see Appendix 12). Leaders were given an additional questionnaire designed to assess the presence of stress perceived by the leader (see Appendix 13). Group members were then thanked for their participation and told where they would eventually be able to read the completed thesis, once the investigation was written up.

IV 4 TASK ORGANIZATION

This study used two different types of work organization called collaboration and coordination (see Appendix 2).

Organization 1 - (Collaboration.) All group members worked simultaneously on each puzzle while the group leader recorded the group's solutions. The group worked for five minutes on Puzzle 1 until told time was up. The group then turned to

Puzzle 2 for five minutes and then to Puzzle 3.

Organization 2 - (Coordination.) Group members worked in an assembly line manner working at separate subtasks in order of precedence. That is, under the guidance of the group leader each individual worked for five minutes on a puzzle, without consulting the other group members, then passed the puzzles on in a set order. In this way each group member built on the work already done by other group members. In order to ensure uniformity, Puzzle 1 was always given to the leader. If the leader was low intelligence Puzzle 2 was given to the medium member and Puzzle 3 was given to the high intelligence member. This pattern was repeated in passing the puzzle from member to member. In this way even distribution was assured of high and low intelligence members beginning on each of the puzzles in turn. At the end of three five minute time blocks each group member had worked on each puzzle for five minutes.

IV 5 MEASURES

Intelligence test

The AH5 intelligence test was used to categorise subjects into low, medium and high categories. This test was selected because it is designed to discriminate among more intelligent subjects, while other intelligence tests, which deal more satisfactorily with the total population, would yield scores clustered together at the top end of the scale. Therefore, when considering a population drawn totally from university students, and when requiring as much differentiation as possible the AH5 appeared to be a suitable measure.

Secondly, as a group test of intelligence it was convenient for testing the numbers required for this study. Subjects were tested in groups ranging in size from two to fifteen people.

The tests were conducted in the manner prescribed by the manual. All tests were conducted in the same room where adequate lighting and ventilation were maintained. Although the two thirty-six item parts of the test are

time restricted (20 minutes each part) no restriction is placed on the time taken for working through the examples. Consequently the sessions ranged in length from about 55 minutes to 75 minutes.

At first results were related to the university norms provided by the manual. These norms could be divided into lower 30%, middle 40% and top 30%. However the results gained tended to be lower than those reported for students at British universities. As these norms were based on British and not New Zealand students, combined with the fact that the norms were developed approximately thirty years ago, it was felt appropriate to disregard the published norms.

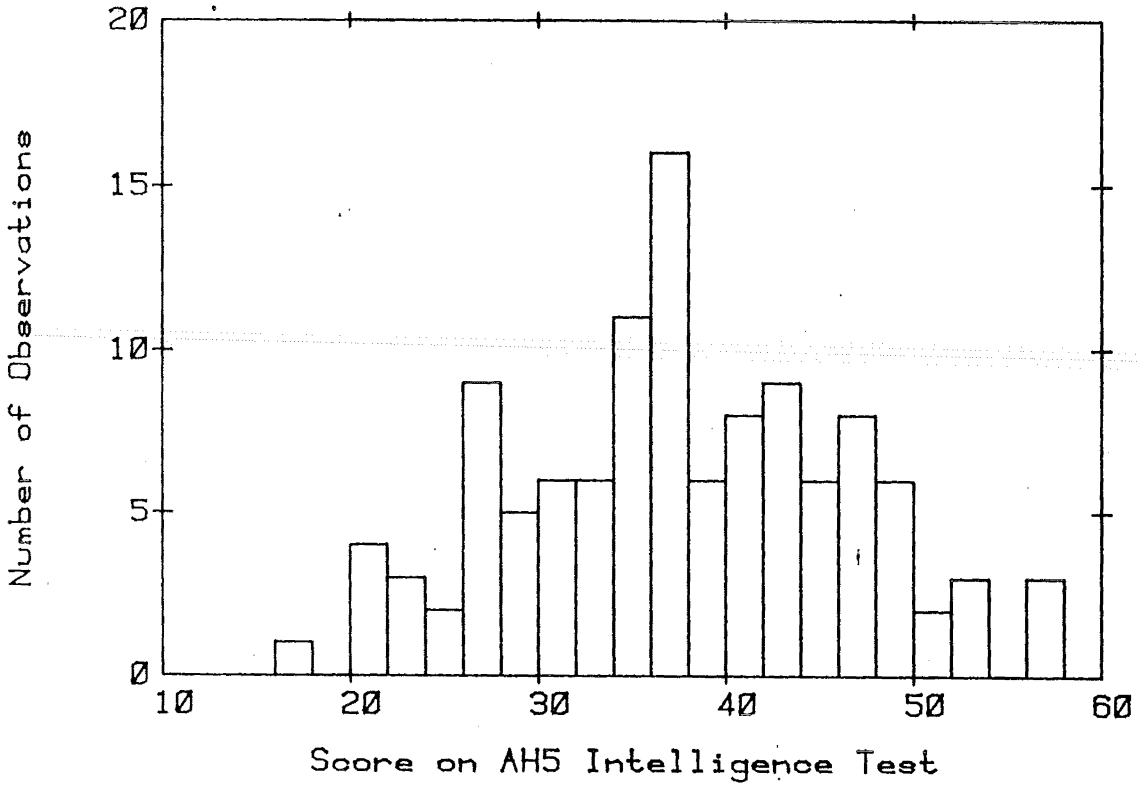
When the raw scores from the test were analyzed it was found that the 118 subjects had formed an approximately normal population distribution. The mean score was 37.2 and the standard deviation 8.8. 69% of the population were found to fall into the area +-1 standard deviation from the mean thus forming a normal curve. It was felt justifiable then to divide the population into thirds on this distribution. Those who scored 33 or less were placed in the lower third, while those scoring 34 to 41 made the middle third and 42 upwards were the upper third. These scores compared with

corresponding British scores can be seen in Table 1 and the distribution of the total population can be seen in Fig 2. It was necessary because of sex and times available for testing to sometimes move people on the cut-off point into the next area. However this was always done where the other group members were placed far enough away to provide sufficient contrast.

TABLE 1: Comparison of British AH5 Norms and Distribution of AH5 Scores in this Study.

BRITISH NORMS:		
Lower	30% --	0-35
Middle	40% --	36-43
Top	30% --	44-72
DISTRIBUTION IN THE PRESENT STUDY:		
Lower	33% --	0-33
Middle	33% --	34-41
Top	33% --	42-57

Figure 2 Histogram of Distribution of AH5 Scores.



Task

The task used in this study was a series of crossword puzzles.

The requirements for a suitable experimental task were many. It required an additive dimension to enable it to be used in both the collaborative and coordinated groups. It had to have a number of variations so that in the collaborative groups three members could work on three different variations of similar tasks. It needed to be an intellective task to appropriately measure the performance relative to the criterion. Wide differentiation of results were also required to provide a spread of scores on the dependent variable.

While Hackman's (1968) research, considered in the literature review, showed the need for using standard tasks this has not been possible in the study. In order to draw some standard tasks from each area, as specified by Hackman, a great deal of time would have been needed for each group to work. In their paper investigating the effects of task type on group structure Kabanoff and O'Brien (1979a) required each group to work for three 45 minute sessions. These subjects were paid for their

involvement. Due to the lack of funds to create such financial incentive in this study it was necessary to make the testing appealing, in order to recruit as many volunteers as possible. A study requiring approximately four hours of students' time would not have been appealing.

The main reason for using similar tasks, in order to increase the comparability of different studies, was also not relevant in this situation. The Kabanoff and O'Brien study (1979b) which investigated leader ability as modified by group organization used creative tasks as they were considering leader creativity so a direct comparison is not appropriate.

Within the leadership area experimental studies have used many different tasks. These include such problems as deciphering cryptograms, coding videotapes, folding paper models and simulated job situations. Crossword puzzles were chosen for this experiment as it was felt they best fulfilled the requirements stated above.

Crossword puzzles have been used in this way before (Shiflett 1972; 1973). They are seen as an intellective task as they require both verbal knowledge and spatial ability. However experience at crossword puzzles tends

to create a learning effect. Because of this, subjects who regularly worked on crossword puzzles of any type were excluded from the sample.

Ten volunteers pilot tested five crossword puzzles adapted from a book of puzzles in order to find three of comparable difficulty level. The pilot volunteers also pointed out clues which were unusual or whose answers, when revealed, were inappropriate. This was mainly due to the American content of the puzzles. Many clues were consequently redesigned but subjects in the group test were warned that the puzzles contained some American material.

Postsession Questionnaires

All group members were given a group atmosphere questionnaire after the task was completed (see Appendix 12). They were asked to fill it out describing the atmosphere of the group during the task performance. This questionnaire was taken directly from Fiedler (1967) as some data were available in the literature with which to compare scores on this measure.

Group leaders were given an additional questionnaire

inquiring about their perception of stress in the situation (see Appendix 13). Those who perceived a certain amount of stress were then asked to specifiy the source of that stress.

CHAPTER V

RESULTS

The following section contains an analysis of the group performance scores in relation to leader intelligence and group organization. Group atmosphere and leader perception of stress measures are also reported. Consideration of the results in relation to the hypotheses will be covered in the next chapter, which will also examine the results within the wider context of related research.

The total numbers of words correct in all three puzzles provided the group performance or productivity scores. Where words were incorrectly spelt but the intention was clear the word was marked as correct. All puzzles were marked by the author to reduce misinterpretations of this rule. A helper confirmed such decisions as appropriate.

Group productivity was analysed in a two-way fixed effects analysis of variance. The results are displayed in Table 2. Group performance means are shown in Table 3.

TABLE 2: Analysis of Variance of Group Performance

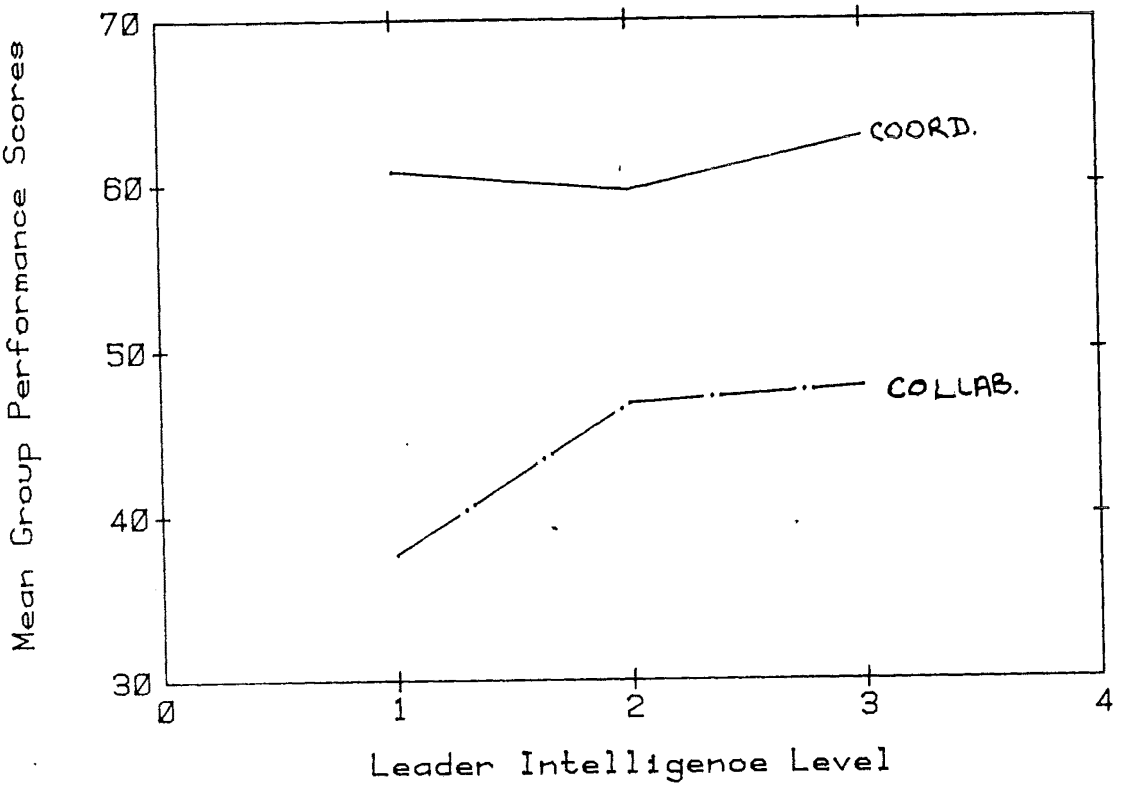
MAIN EFFECTS	MEAN SQUARE	DF.	F VALUES	SIGNIFICANCE OF F
Leader Intelligence	114.6	2	.497	.61
Group Organization	2601.0	1	11.273	.002
INTERACTION EFFECTS				
Leader Intelligence/ Group Organization	89.083	2	.386	.68

TABLE 3: Group Performance Means

GROUP ORGANIZATION:	Collaboration	Coordination
LEADER INTELLIGENCE:		
Low	37.67	60.83
	n = 6	n = 6
Medium	46.83	59.67
	n = 6	n = 6
High	47.83	62.83
	n = 6	n = 6

A significant main effect was found for group organization. Coordination structures were significantly more productive than collaborative structures ($F=11.273, p<.002$). No significant difference was found in the group performance scores of high, medium and low intelligence leaders ($F=.497, p>.6$). No significant interaction effect was found between leader intelligence and group organization. The relationships between leader intelligence and group performance, and group organization and group performance are plotted in Fig 3.

Figure 3 Group Performance Scores and their Relationship to Leader Intelligence and Group Organization.



It was suspected that the lack of the expected significant interaction effect might be due to the sample size of six groups per cell. In order to increase the sample size for low leader intelligence and high leader intelligence the results from those groups in the medium leader intelligence cells were reassigned into the low and high leader intelligence cells by placing a dividing line at the half way point for those leader intelligence scores in the medium leader intelligence cells. This gave a total of nine groups per cell with eighteen in low leader intelligence cells and eighteen in high leader intelligence cells. However there were still no significant intelligence effects and no significant interaction effects.

Another possible reason for the absence of a significant difference was thought to be the restricted range of leader intelligence scores. Possibly, the low, medium and high intelligence leaders were clustered too close together on the intelligence scale to provide adequate contrasts. To test this possibility the groups from the medium leader intelligence cells were excluded and only those with high or low intelligence leaders were compared. Again no significant effects were found apart from group organization.

Sex was also considered as a possible moderator variable of the expected interaction effect. To investigate the possibility of sex affecting the results a further analysis of variance was conducted with sex as a third possible main effect. Again, however, group organization was the only significant main effect and no significant two or three way interactions were found.

POSTSESSION QUESTIONNAIRE

The postsession questionaires were analyzed to investigate differences across groups in terms of leader intelligence levels. There were no significant differences among the group members on group atmosphere scores ($F=.405, p>.6$). However a significant difference was found between low, medium and high intelligence leaders in their perceptions of stress. As can be seen in Table 4 low intelligence leaders perceived less stress than medium or high intelligence leaders and medium intelligence leaders perceived more stress than high intelligence leaders.

TABLE 4: Means and F Value of Leader Perceived Stress

EADER INTELLIGENCE	MEAN	F VALUE	SIGNIFICANCE OF F
Low	2.83	4.875	.01
Medium	4.75		
High	3.33		

Those leaders who marked a level of 5 or more which was described as "slightly stressful" were asked to specify what they felt caused the stress. No one aspect seemed to dominate but a number of different causes were specified. The two most common causes were "lack of ability to lead" and "lack of work knowledge for the task". "The experimenter" was only specified as a source of stress once. "The task" and "group members" were specified by two leaders as stress causes. A number of interesting sources were suggested by individual leaders:
"I knew one person in my group and not the other"

"Hard to lead a group member who is faster than me"

"Trying to drum up enthusiasm was difficult"

"Dual role of trying to find words and lead the group"

"One member had poor knowledge"

Chemers et al (1975) used norms reported by Posthuma (1970) for Group Atmosphere Scales to assess the results of their group atmosphere measures. These norms had an average score of 6.70 with standard deviation of .81. The mean item scores in the present experiments were 6.14 for leaders and 6.17 for followers. These means were

found to be significantly different from those of the norms (Leaders: $Z=3.36, p<.05$; Followers: $Z=5.00, p<.05$). Thus the group atmosphere scores were lower than the average group atmosphere scores provided by the norms.

CHAPTER VI

DISCUSSION

This chapter will consider the results in relation to each of the hypotheses. Previous studies will be compared to show trends or unexpected findings. Suggestions will be made as to how this study could be improved and how future studies could be designed to further investigate this area.

Hypothesis 4 will be discussed first as this deals with the results of the postsession questionnaires which in turn have some relevance to the other hypotheses.

HYPOTHESIS 4

This hypothesis predicted that groups with medium or high intelligence leaders would be more productive than groups with low intelligence leaders if postsession stress measures were low and leader-group relations were average.

Medium intelligence leaders were found to have higher perceptions of stress than either high or low

intelligence leaders. High intelligence leaders were found to have higher perceptions of stress than low intelligence leaders. However, as the mean stress measure for high intelligence leaders was 3 which relates to "slightly non-stressful" this is not felt to be important. Medium intelligence leaders, however, had a mean of 4.77 which equates with "slightly stressful" and at which level leaders specified the perceived source of stress. Thus, at this level stress could form an impermeable screen preventing the leader's intelligence from affecting group performance.

The group atmosphere scores, when compared with normative data, were significantly lower. Thus the condition of average group atmosphere levels does not appear to have been obtained. This, combined with the presence of significant stress for medium intelligence leaders, means that both conditions for hypothesis 4 were not fulfilled. Consequently it is not surprising that no main effect for leader intelligence was obtained in the present study.

This lack of significant difference between the performance levels of low, medium and high intelligence leaders could be explained by the multiple screen model as stress and leader-group relations may be acting as

impermeable screens hindering the leader's intelligence. This is consistent with what the literature reviewed concerning stress and leader-group relations suggested.

HYPOTHESIS 3

Hypothesis 3 predicted that medium intelligence leaders would have more productive groups than those of high intelligence. This would have been confirmed if a significant intelligence effect had been found and if the means showed medium intelligence leader groups as being superior to those of both low and high intelligence leaders. However, the analysis of variance of performance showed no significant differences.

The higher presence of stress in the medium leader intelligence group could have affected their performance levels. This significant difference in the perception of stress across the different leader intelligence levels raises some interesting questions. Why do low intelligence leaders have significantly lower levels of perceived stress? This finding was also obtained by Chemers et al (1975). As a number of different sources are stated as causing the stress it is not possible to suggest one single factor or even to define it in Frost's terms, where stress is seen in terms of role conflict and

role ambiguity. It is possible that low intelligence leaders are less sensitive to the many sources of stress suggested by the leaders in the present study.

Fielder and Leister's (1977) suggestion that stress, other than that in the leader's relationship with the boss, could also prove dysfunctional was found correct. The equivalent to stress in the relationship with the boss might, in this study, be seen to be stress with the experimenter. The experimenter has knowledge required for the task, and in giving this knowledge to the leaders, is communicating expectations much as a boss would. However, the experimenter was only stated as a source of stress by one leader. Yet it is possible that the perception of other sources of stress has hindered the leaders from using their intelligence to influence the group. The lack of a significant difference between the group scores of leaders from different intelligence levels (as described above) would suggest this possibility.

The results of stress perception show medium intelligence leaders as having higher perceived stress levels than high intelligence leaders. As no previous studies have considered medium intelligence leaders in relation to stress it is not possible to state whether

medium intelligence leaders are more sensitive to stress in general or whether this is an isolated result.

HYPOTHESIS 1

Hypothesis 1 predicted that medium or high intelligence leaders with coordinated structure groups would be more productive than leaders from the same intelligence levels in the collaborative organization. This is the key hypothesis in validating group organization as a screen variable for the multiple screen model. It is discussed at this point in order to take into account the possible effect of those factors discussed in Hypotheses 3 and 4. Consequently it must be remembered that any expected effect may be decreased by the presence of stress and the below average leader-group relations. However, stress was most strongly perceived at the medium intelligence leader level. Thus while these leaders may be affected the high intelligence leaders should be less hindered by this factor.

However, Hypothesis 1 was not supported in this study. The required significant interaction effect between leader intelligence and group organization was not found. That is, there was no significant performance

difference between the high (or medium) intelligence leader in the coordination groups and those in the collaborative groups.

While the means for high intelligence leaders in coordinated groups are higher than those in the collaborative groups, this is also true for the leaders from both other intelligence levels. So it does not appear that collaborative groups have hindered the intelligence of the leader from affecting the group's performance.

The significance of group organization as a screen variable must be questioned. The confusing results found in the unpublished O'Brien and Owens (1968) study lend support to this. It is possible that what acts as a screen for one leader ability (ie. creativity) will not attenuate the effect of a different leader ability (i.e. intelligence). Consequently, although significant differences were found in the predicted direction for leader creativity, it should not be considered surprising that these findings were not repeated for leader intelligence.

Further reasons may be suggested to explain the lack of interaction. Possibly the task in the present study

had an effect. However Kabanoff and O'Brien (1979a) found that collaboration as a group organization seemed to be ineffective for a task which required evaluation of multiple, possibly competing solutions. Crossword puzzles would appear to fit this description. This should have decreased the collaborative effect which would have led one to expect even more an enhanced effect with a coordination group organization.

In earlier studies (O'Brien and Owens 1968; 1969) a suggestion is made of a weak link effect. This applies for coordinated groups where it is felt that "a chain is as strong as its weakest link". They suggest that in coordinated groups a person of low ability may severely limit the performance of higher ability members. In the present study no one group was disadvantaged by the presence of such a weak link as all groups contained one member from each third of the sample distribution on the intelligence scale. It is felt that this may be the major reason for the lack of the expected interaction.

Kabanoff and O'Brien (1979b), while they varied the levels of leader and subordinate creativity, did not match groups on each level of creativity. The present study appears to be the first attempt in the study of leader abilities to systematically vary the leader's

ability level while matching the group's ability level, as described above. The group performance results show that the coordinated groups had little variation among the different leader intelligence levels. The group performance means (as shown previously in Table 3) range from 59.67 for groups with medium intelligence leaders to 62.85 for groups with high intelligence leaders. In the collaborative groups, performance means extended from 37.67 for low intelligence leaders' groups to 47.83 for high intelligence leaders' groups (range=10.16). O'Brien and Owens' (1968) original suggestion that collaborative groups enable the leader to make the major contribution appears to be supported. Coordinated groups appear to be as strong as their weakest or strongest link.

It must be acknowledged at this point that the use of a university population, which consequently attenuates the range of intelligence levels within the study, makes this a somewhat tentative proposal. However, the results do appear to show this is a strong possibility as an explanation.

The design used in this study of matching groups on intelligence level has shown that coordination structure enables, not just the high intelligence leader, but also

the high intelligence group member, to make a significnt contribution. It is possible, as was suggested by O'Brien and Owens (1969), that no single person makes the major contribution. Instead the low range between the means suggests the possibility that each member may make an equal contribution according to their ability.

In collaborative structure, however, it does appear that the leader has a more decisive role to play in the success of the group. Here the group means were more closely related to leader intelligence, although there was no significant difference among the different leader intelligence levels.

HYPOTHESIS 2

This hypothesis was supported. A significant difference was found between the performance levels for coordinated and collaborative groups with coordinated groups being far superior.

This result is in line with the findings from previous research. Coordination is explained by O'Brien and Owens (1969) as the organization which best utilizes the resources of each member of the group while reducing unnecessary group interaction which restricts the group

from organizing the best contributions from members in a systematic fashion.

While this effect has been well supported in this and the previous research, the external validity of this to non-laboratory situations would appear to be questionable. The comparable work setting for coordinated groups would be an assembly line. Much research has been conducted on the topics of job enrichment, an approach to job design which seeks to extend job situations from an assembly line situation to those involving a group in the total task. The question which must therefore be asked about coordination is whether it would prove equally as productive or superior to collaboration as a form of organization if it were continued for an extended period of time. It is possible that the lack of group interaction, which is suggested to be its positive aspect, could become a frustration and a restriction for group members.

SUGGESTIONS FOR FURTHER RESEARCH

A number of studies can be envisaged to answer questions raised as part of this study. A study of stress and its effects on leaders of different intelligence levels could further illuminate that area.

Stress could be experimentally manipulated to see whether lower intelligence leaders are merely less sensitive to the presence of stress. Medium intelligence leaders and their perceptions of stress are also puzzling as the present study found this group most perceptive of stress. Is this finding an isolated one or does it represent an example of a genuine effect? The answers to these questions could define more specifically stress as a screen variable in the multiple screen model and may begin to explain why stress hinders the leaders intelligence from affecting group performance.

Further studies could investigate the suggestion that medium intelligence leaders are possibly more effective in developing productive groups. Without the undesirable confounding of stress this hypothesis might be supported.

The real interest, however, must lie in future studies of coordination and collaboration as they relate to leader intelligence or other leader abilities. A replication of Kabanoff and O'Brien's (1979b) study, using groups matched on creativity, would test the reasons suggested by the present study for its failure to replicate the earlier results. Future studies of group organization could also consider the longer term effects

of coordination structure on a group by lengthening the time span of experiments, by employing for example, a time series design. Until these studies show otherwise group organization appears to be in doubt as a screen variable.

It must be conceded that the present study has a number of shortcomings. The task, while suitable for both group structures and thus probably achieving adequate internal validity, lacked external validity as a group activity. The subjects, as they were all drawn from a university population represent a skewed distribution of the general intelligence scale, and thus more definitive results may have been found with subjects drawn from a wider range of intelligence levels.

CHAPTER VII

CONCLUSION

The aim of this study has been met. It was found that group organization did not affect the relationship between leader intelligence and group performance.

It has been suggested that coordinated groups which had previously been found to benefit the relationship between high creativity leaders and group performance, merely permit all group members to have a significant input into the task. The present study's use of matching groups, with a member drawn from each of the low, medium and high intelligence levels, enabled the distinction to be made. It would appear now that a high intelligence group member's input is more significant in coordinated groups than in collaborative groups. However, the status of the group member is unimportant. This must be qualified by acknowledging again the restricted intelligence range of these subjects. Tentatively, however, this appears to be an adequate explanation of the results.

Thus, in Fiedler and Liester's terms, group organization does not appear to be a screen in the

relationship between leader intelligence and group performance. Two other screens did show some effects. Both stress perceived by the leader, and leader-group relations did appear to have a blocking effect on leader intelligence in this study as no significant main effect was found for leader intelligence. This lack of significant difference among the group performance levels could be explained by the presence of these two interpersonal screens.

The relationship between the intelligence of the leader and the performance of the group appears to be an unstable one. The leader's intelligence effect seems to be hindered and absorbed so easily that questions tend to arise concerning the basis of our expectations for this relationship. Yet the group performance means across the different leader intelligence levels show a trend in support of the expected relationship as the means are lowest for low intelligence leaders, increase for medium intelligence leaders and are highest for high intelligence leaders.

How then does this investigation of leader intelligence and its relationship to group performance aid the utilization of managerial intelligence? It is difficult, as always, to draw conclusions from a

laboratory study and apply them to a field setting. The only sure conclusion that this study can draw is that changing to a coordinated group structure is likely to increase a group's performance level. For how long and at what cost is uncertain. However this conclusion is not an adequate solution to the original problem of finding the conditions under which high intelligence leaders are most effective.

Many factors are constantly interacting in a leadership environment which affect a group's performance. Each factor must be considered carefully to discern the significance of its effect. This study has considered group organization in this way and it is hoped these data will add to others to help provide greater insight into the leadership situation.

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APPENDIX 1

STRUCTURAL ROLE THEORY

In structural role theory group structure is described in terms of three elements (persons, positions, and tasks) and the sets of relationships which order these elements. The three elements defined are:

Person - defined as a human being who has no relationships to other human beings except for those laid down by the rules of his office, and no characteristics other than those prescribed for assigning him to the occupancy of a given position.

Position - defined as a location on an organization chart, a concept which gains its meaning through being connected to (a) persons by assignment relations, (b) to tasks by the allocation relation, and (c) to other persons by the power relation.

Task - a primitive term meaning anything that has to be done.

The terminology of digraph theory is used to illustrate and describe how any given sets of these three elements may be logically interrelated. The explanatory digraphs of the structures used in this study are shown in Appendix 2.

APPENDIX 2

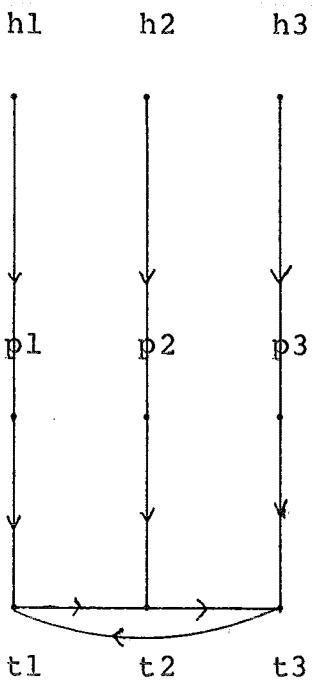
Digraphs of structures used in this study

Terminology used:

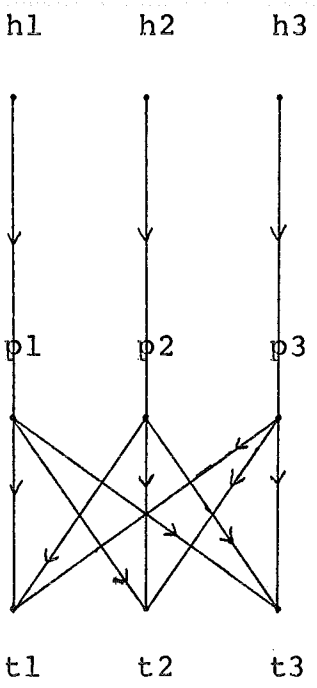
(h) persons

(p) positions

(t) tasks



COLLABORATION



COORDINATION

APPENDIX 3

Biographical Data and Availability for Testing

PLEASE FILL IN THE FOLLOWING INFORMATION AND WHERE APPROPRIATE CIRCLE THE CORRECT OPTION

NAME:

ADDRESS:

PHONE NO.:

SEX: M / F

YEAR AT UNIVERSITY: 1 / 2 / 3 / 4 / 5 / 6 / 7 / MORE

FULL TIME / PART-TIME

UNDERGRADUATE / POSTGRADUATE

DEGREE:

MAJOR:

WHAT POSSIBLE TIMES ARE YOU AVAILABLE FOR THE FINAL TESTING SESSION?

MON:

TUES:

WED:

THURS:

FRI:

SAT:

SUN:

MANY THANKS FOR YOUR MUCH APPRECIATED ASSISTANCE

APPENDIX 4

Collaborative Leader Instructions

The purpose of this experiment is to investigate small group behaviour. You and your group will be given 4 crossword puzzles. The first one, marked A, is a practice one which will help you to familiarize yourself with the style of the puzzle. You should spend 3 minutes working on this puzzle together. At the end of this time you may like to discuss the style and best ways of dealing with it for a few minutes.

The next puzzle, marked 1, you will work on together as a group for 5 minutes completing as much as you can. When the timer sounds you are to stop working on that puzzle and work on puzzle 2 for five minutes. Again after 5 minutes you will stop that puzzle when the timer sounds and begin on Puzzle 3.

Your general role as leader is firstly to arrange and maintain the group's organization. This will involve explaining to them these instructions. During the work time you are to provide suggestions for solutions along with other group members and to help evaluate and approve the suggestions of the other members. Your role also

includes being the recorder of the final solutions you and your group decide are correct. Although all group members will have a copy of the crossword to help with suggestions your puzzle should be the one used by you to record the final answers and this will be the copy used for the results.

My role will be to set the timer at the appropriate points when you tell me the group is ready.

Do you have any questions?

You now have about 5 minutes to communicate these instructions to the group.

APPENDIX 5

Coordinating Leader Instructions

The purpose of this experiment is to investigate small group behaviour. You and your group will be given 4 crossword puzzles. The first one, marked A, is a practice one which will help you to familiarize yourself with the style of the puzzle. Each group member including yourself should spend 3 minutes working on this practice puzzle on your own.

For the next 15 minutes the group will be organized like an assembly line to work on the next three puzzles. Each one of you will work on a different puzzle for 5 minutes without communicating to the other group members. You will take puzzle 1 and give (insert name) puzzle 2 and .... puzzle 3.

At the end of 5 minutes a timer will sound and the puzzles are to be passed on. You will then work on puzzle 3 (building on the work already done) and .... on puzzle 2 and .... on puzzle 1. This will continue for another five minutes. When the timer sounds you will rotate the puzzles for the final time with you working on number 2 and .... working on 1 and .... working on 3.

At the end of this time you will each have worked on each puzzle for 5 minutes. Should anybody decide that a previous solution is incorrect they may change it. However they are not permitted to discuss it.

Your role as leader is primarily to arrange and maintain the group's organization. This will involve explaining these instructions to them and ensuring that the changeover works correctly. My role will be to set the timer at the appropriate points when you tell me the group is ready.

Do you have any questions?

You now have about 5 minutes to communicate these ideas to your group.

APPENDIX 6

Instruction Sheet For Collaborative Leaders

YOU HAVE 4 PUZZLES (A ,1 ,2 ,3)
(YOU HAVE 3 COPIES OF EACH)

PUZZLE A ===== PRACTICE PUZZLE (3 MINS)
(FOLLOWED BY DISCUSSION)

PUZZLE 1 (5 MINS)

PUZZLE 2 (5 MINS)

PUZZLE 3 (5 MINS)

ABBREVIATIONS

(LAT.) LATIN

(Fr.) FRENCH

(Abbr.) ABBREVIATED

(colloq.) COLLOQUIALISM

(US spell) U.S.SPELLING

(naut.) NAUTICAL

(poet.) POETICAL

APPENDIX 7

Instruction Sheet For Coordinating Leaders

YOU HAVE 4 PUZZLES (A,1,2,3)

YOU HAVE 3 COPIES OF PUZZLE A
YOU HAVE 1 COPY EACH OF PUZZLE 1,2 AND 3

PUZZLE A === PRACTICE PUZZLE (3 MINUTES) (FOLLOW BY DISCUSSION)

	5 MINS		5 MINS		5 MINS
PUZZLE 1	_____	>>>>>	_____	>>>>	_____
PUZZLE2	_____	>>>>>	_____	>>>>	_____
PUZZLE3	_____	>>>>>	_____	>>>>	_____

LEADER

_____ _____

ABBREVIATIONS

(Lat.) LATIN

(Fr.) FRENCH

(abbr.) ABBREVIATED

(colloq) COLLOQUILISM

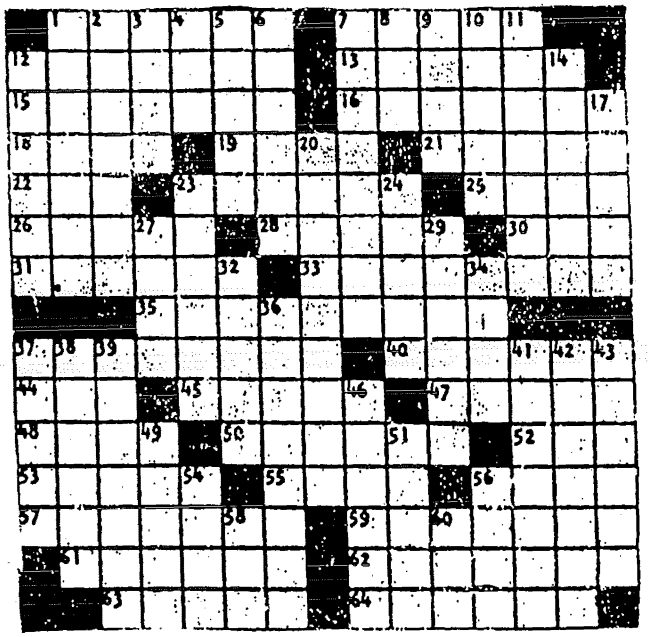
(US spell) US SPELLING

(naut.) NAUTICAL

(poet.) POETICAL

APPENDIX 8

Puzzle A



ACROSS

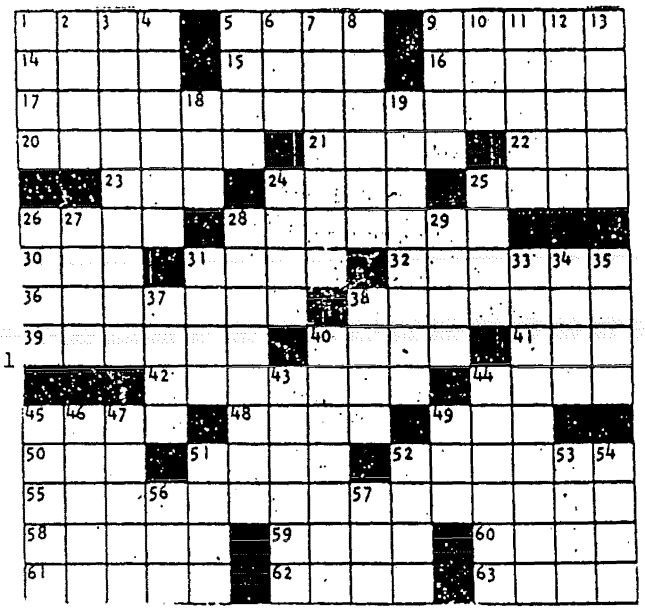
1 Glass shaper
7 Vehement talker
12 Supply
13 Dicing number
15 Affectionate blow (2 words)
16 Acid flavoring
18 So be it!
19 Ground burrower
21 Incensed
22 Form of "it is"
23 Make a varied set
25 Bullet
26 First family of British politics
28 Ipecac plants
30 Before
31 Arranged situations
33 Gets worked up for
35 Despisers
37 Evergreen fruit (2 words)
40 Gained new strength
44 Macaw
45 Add up
47 Golf shot
48 Cooking utensils
50 Inner courtyards
52 No fellow to trust
53 Girls name
55 Doctrine followers (suffix)
56 Put on cargo
57 More than a few
59 More inclined to bolt
61 Give much time to
62 Horseshoe shots that are almost ringers
63 Stitched
64 Blunders

DOWN

1 Compund of non-metallic element
2 At tennis, 6-0 (2 words)
3 Very hot room
4 The means of repartee
5 Round cheeses
6 Rest
7 Deeply respectful
8 Arab name
9 --, vidi, vici
10 Tinker to -- to Chance
11 Entertains well
12 Dentures
14 The world of growing things
17 Kings (Lat.)
20 Cozy sofas for (2 words)
23 Phase
24 Spud, for short
27 Undraped
29 Cuts to ribbons
32 Bend over
34 European country
36 Involved
37 Daddies
38 Pressed
39 People of the country
41 Haranguer
42 Escapers
43 Discourage by fear
46 Small
49 Boys name
51 Willow
54 In a rank
56 Floor covering
58 Consumed
60 Deface

APPENDIX 9

Puzzle 1



ACROSS

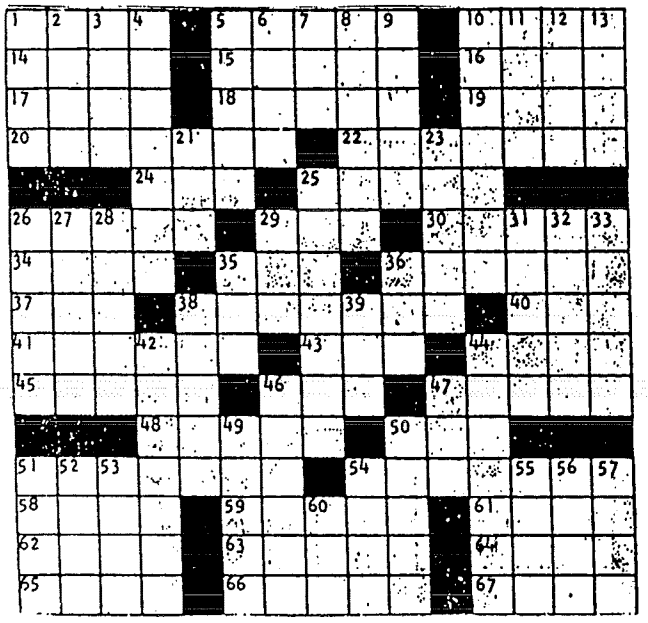
1 Smooth-speaking
5 Give the cold shoulder to
9 Educate
14 From "Young Doctors"
15 John XXIII
16 Taj Mahal country
17 Pour heavily (colloq. phrase)
20 Shoe
21 Victim of the wooden horse trick
22 Blind Nocturnal Animal
23 Encountered
24 Small amounts. (colloq)
25 Spooky (U.S. spell)
26 Bradley (abbr.)
28 Children's room
30 Umpire's call
31 Word of Admonition
32 Place for cars
36 His magic word was "Sesame"
38 Equipment for catching memories
39 Summon back
40 Utters
41 Sells the firm
42 Calorie counters
44 Sarcrosanct
45 Wings (Lat.)
48 Catcher's glove
49 Used by kidnappers
50 Wrestler's milieu
51 Role
52 Silver-white metal
55 Department that collects internal taxes
58 Alarm
59 Expensive
60 Land measure
61 Crowd together
62 Sea bird
63 Appear

DOWN

1 Clothing
2 Teller of untruths
3 Of language peculiar to a people
4 Slammed
5 Bridge
6 Negative word
7 One who has risen suddenly
8 Goatees
9 Neat
10 Windup
11 Sun-dried brick
12 Cherroot
13 Done quickly
18 Feline
19 Bouquets
24 Salad fish
25 C. Bronte's "Jane --"
26 Wild pig
27 Govern
28 Peer
29 Ship collides
31 Spanish painter
33 Pride
34 Scot
35 Catch sight of
37 Commanded
38 Wagon
40 Colonist
43 Declamatory speech
44 -- corpus (legal writ)
45 Faulty
46 Spear
47 Rose essence
49 Head of state (abbr.)
51 Victim
52 Cover with wax
53 Attract
54 Abound
56 Go astray
57 Tried for office

APPENDIX 10

Puzzle 2



ACROSS

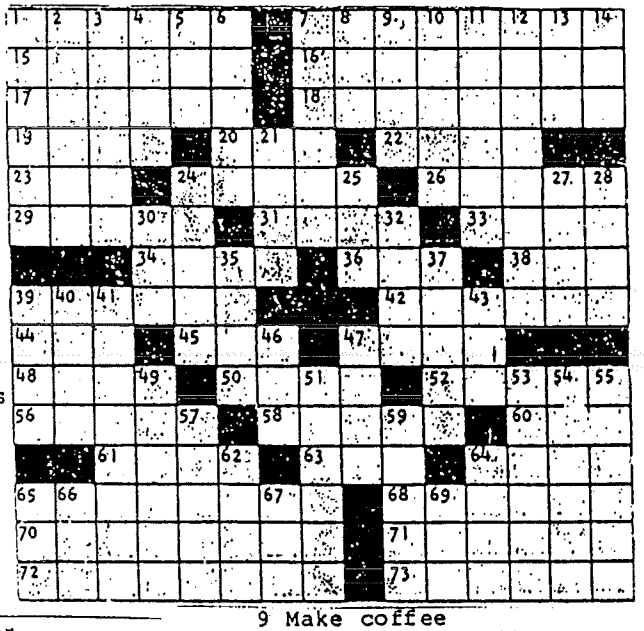
1 The front
5 Water in ship's bottom
10 On
14 Greek athletic contest
15 Oak seed
16 Give medicine
17 Russian
18 Sired
19 Field rodent
20 Tiresome
22 Guest
24 Geographical cape
25 Supplies steam
26 Unfriendly
29 Friend
30 From Iowa
34 Brought into the world
35 Utensil
36 Infuriate
37 Auckland Regional Authority
38 Hunting hound
40 Victory sign
41 Forty winks
43 Trick (colloq)
44 Tear apart
45 Genuflect
46 Cool oneself
47 Covered with warts
48 Unit of measure
50 Diveine being
51 party purveyor
54 --of hand: legerdemain
58 Singles
59 Betel palm
61 Egyptian beauty
62 Unaccompanied
63 Crop up again
64 Halo
65 Organized insects
66 Cram for tests
67 Heavy metal

DOWN

1 Securely tied
2 Give the eye
3 Pathway
4 Place in a locality
5 Clerks in India
6 Covers cake
7 Timber
8 Broken stones
9 Abstract entities
10 Counsel giver
11 Train's whistle
12 Norway's capital
13 English lord
21 Dunce
23 Smart
25 Hand powered railcar
26 Backward
27 Electronic navigation device
28 Make speeches
29 Equality
31 Vacillate
32 Secret .....
33 Poor
35 Apple Seed
36 Age
38 Bundle maker
39 Spanish noble
42 Avenging agents
44 Extreme political group member
46 Rummage
47 Trouble and worry
49 Cry
50 Dazzling
51 Coca .....
52 Anonymous
53 Portable dwelling
54 Skim along (Naut.)
55 Sticking agent
56 Greek Goddess
57 Warty Frog
60 Old French coin

APPENDIX 11

Puzzle 3



ACROSS

1 Facets
7 Dirty work at the plant
15 Ply or layer
16 747 or 727
17 Even more than enough
18 Preying animal
19 Small barracuda
20 Deadly snake
22 Past of to be
23 Sea: Fr.
24 Linen
26 Electric catfishes
29 Boxing ring
31 Lined up
33 Road sign
34 Bitter chemical
36 Tatter
38 Before (poet.)
39 Game fish
42 Coconut meats for oil extractioin
44 Soul: Fr.
45 Pinch
47 Drill a well
48 Prefix meaning wood
50 Fuss
52 Crossbar patterns
56 Vinegar bottle
58 Keyed up
60 Got together
61 Their: Fr.
63 Detective novel (slang)
64 To box
65 Last moment for delivery
68 Gaping
70 Rope rungs of ship's ladders
71 Responds
72 Most sheer
73 The green wire....appliances

DOWN

1 Part of Blood
2 Picnic Basket
3 Electrical unit of current strength
4 River sediment
5 Easterly direction (abbr.)
6 Biblical woman's name
7 Trench digger
8 Make public
9 Make coffee
10 Of longer standing
11 Crowns
12 Insectivorous animal
13 Prefix meaning earth
14 Figure wrongly
21 Sewn line
24 Beauty parlor
25 Crag
27 Girl's name
28 Goddess of hope
30 Snooze
32 City in Texas
35 Standard... of measurement
37 Deep cleft in a mountain
39 Perfumed powder
40 Afghan chief
41 Adjust
43 Through
46 Utensil
47 Vertibrate skeleton
49 Htpodermic
51 Loathe
53 Brunt of collision
54 Shortage
55 Emphasize
57 dutch flower
59 Frighten
62 Russian hemp
64 Outstanding
65 MDs
66 Consume
67 Not elsewhere specified (abbr.)
69 Ocean

APPENDIX 12

Group Atmosphere Questionnaire

On the following sheet are pairs of words which are opposite in meaning such as GOOD and BAD .You are asked to describe the atmosphere of your group by placing an 'X' in one of the eight spaces on the line between the two words.

Each space represents how well the description fits the atmosphere of your group,as if it were written:

GOOD								BAD
8	7	6	5	4	3	2	1	
VERY GOOD	QUITE GOOD	SOMEWHAT GOOD	SLIGHTLY GOOD	SLIGHTLY BAD	SOMEWHAT BAD	QUITE BAD	VERY BAD	

For example: If you were to describe the atmosphere of your group and you found it to be quite good you would put an X in the second space from the word GOOD, like this:

		X						
GOOD								BAD
8	7	6	5	4	3	2	1	

You will notice that in this example the words explaining the range between the two descriptions are ommitted and only numbers are used to show the different stages.In the items below the range of descriptions will not be given.Use the numbers to represent the words and refer back to the top example for help if you need to.

Look at the words at both ends of the line before you put in your 'X'.

Remember that there are no right or wrong answers.Work rapidly ; your first answer is likely to be the best.

Please do not omit any items and mark each item only once.

FRIENDLY								UNFRIENDLY
ACCEPTING								REJECTING
SATISFYING								FRUSTRATING
ENTHUSIASTIC								UNENTHUSIASTIC
PRODUCTIVE								NONPRODUCTIVE
WARM								COLD
COOPERATIVE								UNCOOPERATIVE
SUPPORTIVE								HOSTILE
INTERESTING								BORING
SUCCESSFUL								UNSUCCESSFUL
	8	7	6	5	4	3	2	1

APPENDIX 13

Leader Stress Questionnaire

ADDITIONAL LEADER ONLY QUESTION

This additional question deals with the presence or absence of stress in the whole situation. Please place your 'X' in the space which most appropriately describes how stressful you found this session.

VERY STRESSFUL								NOT STRESSFUL
8	7	6	5	4	3	2	1	

If your 'X' is 5 or more please specify which factors may have produced the stress. If more than one factor is relevant please number them with the most stressful first.

____ YOUR EXPERIMENTER
____ YOUR TASK
____ YOUR LACK OF ABILITY TO LEAD
____ YOUR LACK OF WORD KNOWLEDGE FOR THE TASK
____ YOUR GROUP MEMBERS
____ OTHER (please specify)
____ OTHER (please specify)